

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

Claim 1 (canceled)

Claim 2. (currently amended) A transistor structure, comprising:
a gallium arsenide (GaAs) semiconductor substrate;
a barrier layer disposed over the substrate;
an $In_y Ga_{1-y}$ As lower channel layer disposed on the barrier layer, where y is the mole fraction of In content in the lower channel layer;
an $In_x Ga_{1-x}$ As upper channel layer disposed on the lower channel layer, where x is the mole fraction of In content in the upper channel layer and where x is different from y;
an InAlAs Schottky layer on the $In_x Ga_{1-x}$ As upper channel layer; and
~~The transistor structure recited in claim 1 wherein the lower channel layer has a bandgap greater than the bandgap of the upper channel layer.~~

Claim 3. (currently amended) A transistor structure, comprising:
a gallium arsenide (GaAs) semiconductor substrate;
a barrier layer disposed over the substrate;
an $In_y Ga_{1-y}$ As lower channel layer disposed on the barrier layer, where y is the mole fraction of In content in the lower channel layer;
an $In_x Ga_{1-x}$ As upper channel layer disposed on the lower channel layer, where x is the mole fraction of In content in the upper channel layer and where x is different from y;
an InAlAs Schottky layer on the $In_x Ga_{1-x}$ As upper channel layer and~~The transistor structure recited in claim 1 wherein the lower channel layer has a bulk electron mobility lower than the bulk electron mobility of the upper channel layer.~~

Claim 4. (currently amended) A transistor structure, comprising:
a gallium arsenide (GaAs) semiconductor substrate;

a barrier layer disposed over the substrate;
an In_y Ga_{1-y} As lower channel layer disposed on the barrier layer, where y is the mole fraction of In content in the lower channel layer;
an In_x Ga_{1-x} As upper channel layer disposed on the lower channel layer, where x is the mole fraction of In content in the upper channel layer and where x is different from y;
an InAlAs Schottky layer on the In_x Ga_{1-x} As upper channel layer;
wherein the lower channel layer has a bandgap greater than the bandgap of the upper channel layer and –
The transistor structure recited in claim 1 wherein x is in the range between 0.15 and 0.90 and y is in the range between 0.0 and 0.65.

Claim 5. (original) The transistor structure recited in claim 4 wherein x is substantially 0.53 and y is substantially 0.43.

Claim 6 (cancelled)

Claim 7. (currently amended) A transistor structure, comprising:
a semiconductor substrate;
a barrier layer disposed over the substrate;
a lower channel layer disposed on the barrier layer;
an upper channel layer disposed on the lower channel layer, such lower channel being of the same material as the upper channel, the upper and lower channels having different mole fractions of an common element used in such upper and lower channel layers;
a Schottky layer on the upper channel layer and;
The transistor structure recited in claim 6 wherein the lower channel layer has a bandgap greater than the bandgap of the upper channel layer.

Claim 8. (currently amended) A transistor structure, comprising:
a semiconductor substrate;

a barrier layer disposed over the substrate;
a lower channel layer disposed on the barrier layer;

an upper channel layer disposed on the lower channel layer, such lower channel being of the same material as the upper channel, the upper and lower channels having different mole fractions of an common element used in such upper and lower channel layers;
a Schottky layer on the upper channel layer and

The transistor structure recited in claim 6 wherein the lower channel layer has a bulk electron mobility lower than the bulk electron mobility of the upper channel layer.

Claim 9. (original) The transistor structure recited in claim 7 wherein the substrate comprises GaAs and wherein the upper and lower channel layers comprise InGaAs.

Claim 10. (original) The transistor structure recited in claim 9 wherein the upper and lower channel layers include indium.

Claim 11. (cancelled)

Claim 12. (currently amended) A transistor structure, comprising:
a gallium arsenide (GaAs) semiconductor substrate;
a lattice matching structure disposed over the GaAs substrate, such layer comprising
InAlGaAs, such InAlGaAs having mole fractions of Al, In, and Ga of the lattice match layer
gradually changing with height with a bottom portion having a lattice constant matching
GaAs and a top portion having a lattice constant of the InAlAs barrier and InGaAs channel
layers;

an InAlAs barrier layer disposed over the lattice match layer;
an In_y Ga_{1-y} As lower channel layer disposed on the barrier layer, where y is the mole
fraction of In content in the lower channel layer;
an In_x Ga_{1-x} As upper channel layer disposed on the lower channel layer, where x is
the mole fraction of In content in the upper channel layer and where x is different from y; an
InAlAs Schottky layer disposed on the In_x Ga_{1-x} As upper channel layer;
an InGaAs cap disposed over the InAlAs Schottky layer and;
The transistor structure recited in claim 11 wherein the lower channel layer has a

bandgap greater than the bandgap of the upper channel layer.

Claim 13. (currently amended) A transistor structure, comprising:
a gallium arsenide (GaAs) semiconductor substrate;
a lattice matching structure disposed over the GaAs substrate, such layer comprising
InAlGaAs, such InAlGaAs having mole fractions of Al, In, and Ga of the lattice match layer
gradually changing with height with a bottom portion having a lattice constant matching
GaAs and a top portion having a lattice constant of the InAlAs barrier and InGaAs channel
layers:

an InAlAs barrier layer disposed over the lattice match layer;
an In_y Ga_{1-y} As lower channel layer disposed on the barrier layer, where y is the mole
fraction of In content in the lower channel layer;
an In_x Ga_{1-x} As upper channel layer disposed on the lower channel layer, where x is
the mole fraction of In content in the upper channel layer and where x is different from y; an
InAlAs Schottky layer disposed on the In_x Ga_{1-x} As upper channel layer,
an InGaAs cap disposed over the InAlAs Schottky layer and

~~The transistor structure recited in claim 11 wherein the lower channel layer has a bulk electron mobility lower than the bulk electron mobility of the upper channel layer.~~

Claim 14. (currently amended) A transistor structure, comprising:
a gallium arsenide (GaAs) semiconductor substrate;
a lattice matching structure disposed over the GaAs substrate, such layer comprising
InAlGaAs, such InAlGaAs having mole fractions of Al, In, and Ga of the lattice match layer
gradually changing with height with a bottom portion having a lattice constant matching
GaAs and a top portion having a lattice constant of the InAlAs barrier and InGaAs channel
layers:

an InAlAs barrier layer disposed over the lattice match layer;
an In_y Ga_{1-y} As lower channel layer disposed on the barrier layer, where y is the mole
fraction of In content in the lower channel layer;
an In_x Ga_{1-x} As upper channel layer disposed on the lower channel layer, where x is

the mole fraction of In content in the upper channel layer and where x is different from y; an InAlAs Schottky layer disposed on the $In_x Ga_{1-x}$ As upper channel layer,
an InGaAs cap disposed over the InAlAs Schottky layer;
wherein the lower channel layer has a bandgap greater than the bandgap of the upper
channel layer and

~~The transistor structure recited in claim 11 wherein x is in the range between 0.15 and 0.90 and y is in the range between 00.0 and 0.65.~~

Claim 15. (original) The transistor structure recited in claim 14 wherein x is substantially 0.53 and y is substantially 0.43.

Claim 16. (cancelled)

Claim 17. (currently amended) A transistor structure, comprising:
a semiconductor substrate;
a lattice match layer disposed over the substrate;
an barrier layer disposed over the lattice match layer;
a lower channel layer disposed on the barrier layer;
an upper channel layer disposed on the lower channel layer, such lower
channel being of the same material as the upper channel, the upper and lower channels having
different mole fractions of an common element used in such upper and lower channel layers;
an Schottky layer on the upper channel layer and
~~The transistor structure recited in claim 16 wherein the lower channel layer~~
has a bandgap greater ~~that~~ than the bandgap of the upper channel layer.

Claim 18. (currently amended) A transistor structure, comprising:

a semiconductor substrate;
a lattice match layer disposed over the substrate;
an barrier layer disposed over the lattice match layer;
a lower channel layer disposed on the barrier layer;
an upper channel layer disposed on the lower channel layer, such lower

channel being of the same material as the upper channel, the upper and lower channels having different mole fractions of an common element used in such upper and lower channel layers;
an Schottky layer on the upper channel layer and

~~The transistor structure recited in claim 16 wherein the lower channel layer has a bulk electron mobility lower than the bulk electron mobility of the upper channel layer.~~

Claim 19. (original) The transistor structure recited in claim 17 wherein the substrate comprises GaAs and wherein the upper and lower channel layers comprise InGaAs.

Claim 20. (original) The transistor structure recited in claim 19 wherein the upper and lower channel layers include indium.

Claim 21. (cancelled)

Claim 22. (currently amended) A transistor structure, comprising:

a semiconductor substrate;

an indium aluminum arsenide (InAlAs) barrier layer disposed over the substrate;

an $In_y Ga_{1-y} As$ lower channel layer disposed on the barrier layer, where y is the mole fraction of In content in the lower channel layer;

an $In_x Ga_{1-x} As$ upper channel layer disposed on the lower channel layer, where x is the mole fraction of In content in the upper channel layer and where x is different from y ; and an InAlAs Schottky layer on the $In_x Ga_{1-x} As$ upper channel layer and

~~The transistor structure recited in claim 21 wherein the lower channel layer has a bandgap greater than the bandgap of the upper channel layer.~~

Claim 23. (original) The transistor structure recited in claim 22 wherein the lower channel layer has a bulk electron mobility lower than the bulk electron mobility of the upper channel layer.

Claim 24. (original) The transistor structure recited in claim 23 wherein x is in the range between 0.15 and 0.90 and y is in the range between 0.0 and 0.65.

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Amendments to the Drawings:

The attached sheets of drawings includes changes to FIGS. 1-3 and are labeled as "replacement sheets". The labeled "PRIOR ART" has been inserted.